Sept. 5, 1944. B. T. COLE 2,357,630

KNITTED ARTICLE

Original Filed July 14, 1942 3 Sheets-Sheet 1

FIG. 1.

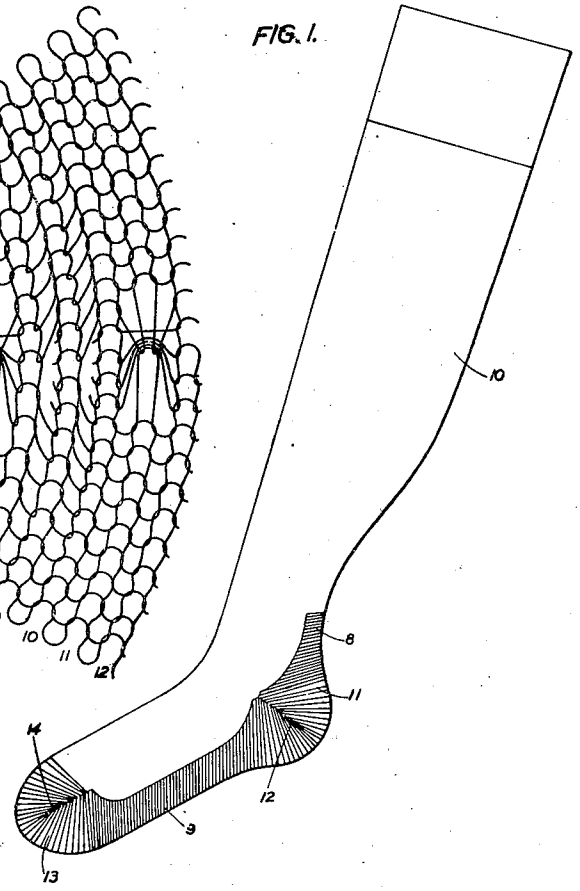
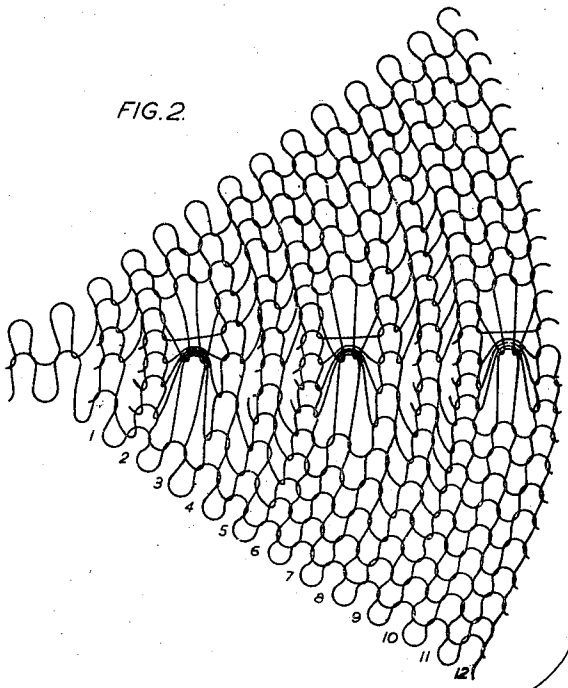


FIG. 2.



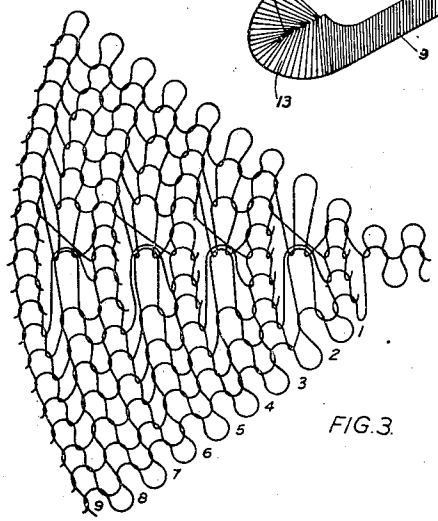


FIG. 3.

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Sept. 5, 1944. B. T. COLE 2,357,630

KNITTED ARTICLE

Original Filed July 14, 1942 3 Sheets-Sheet 2

FIG. 6

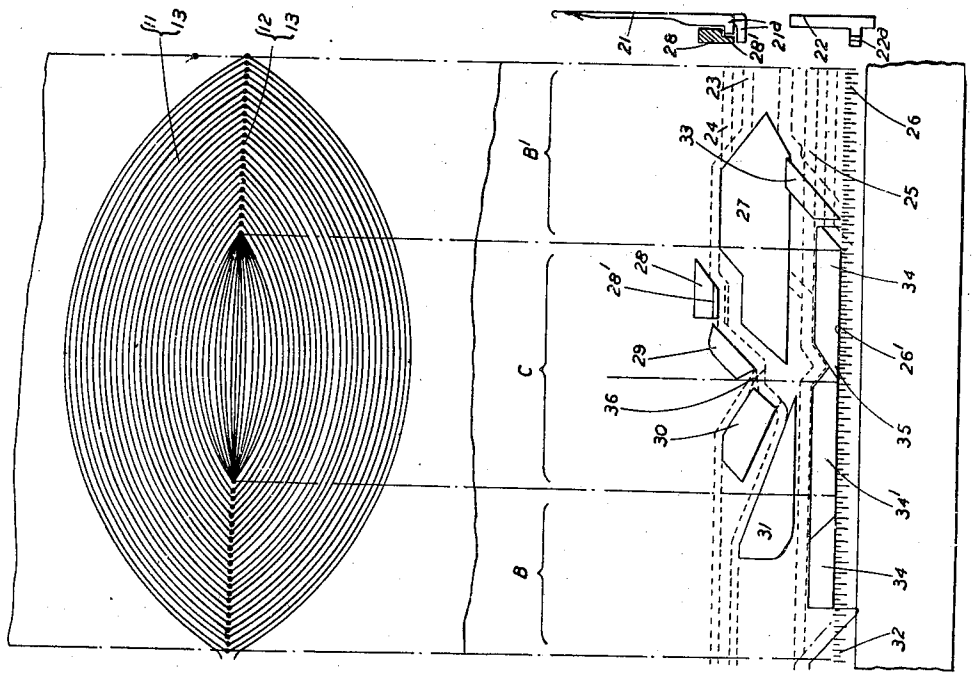
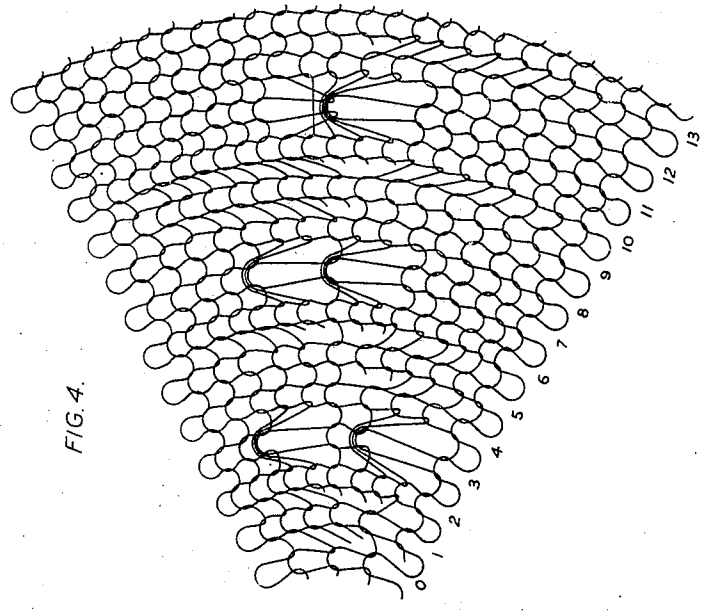


FIG. 4.



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Sept. 5, 1944. B. T. COLE 2,357,630

KNITTED ARTICLE

Original Filed July 14, 1942 3 Sheets-Sheet 3

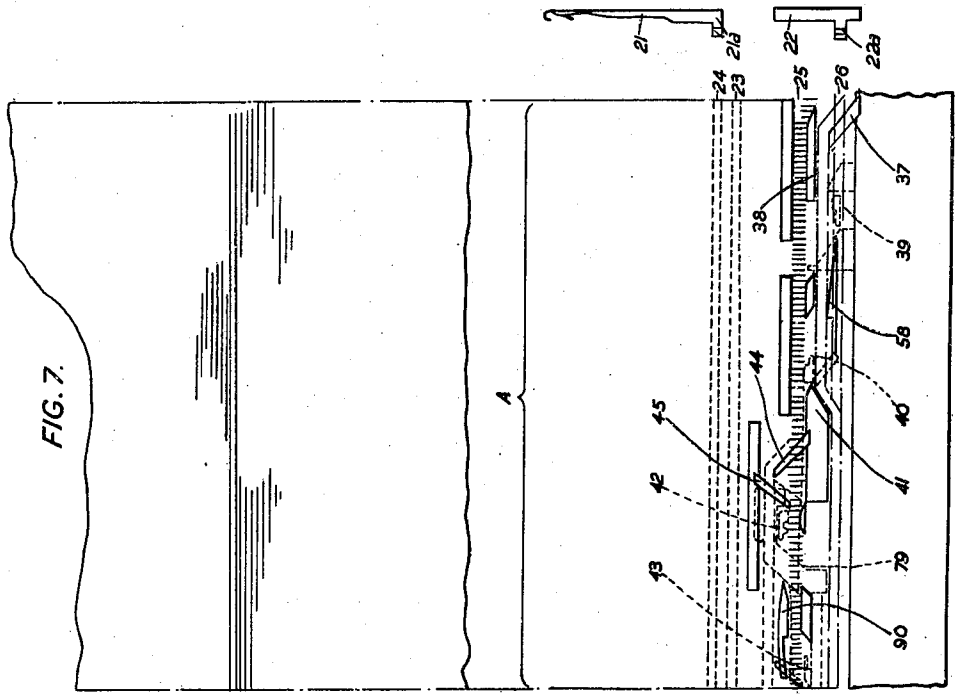


FIG. 7.

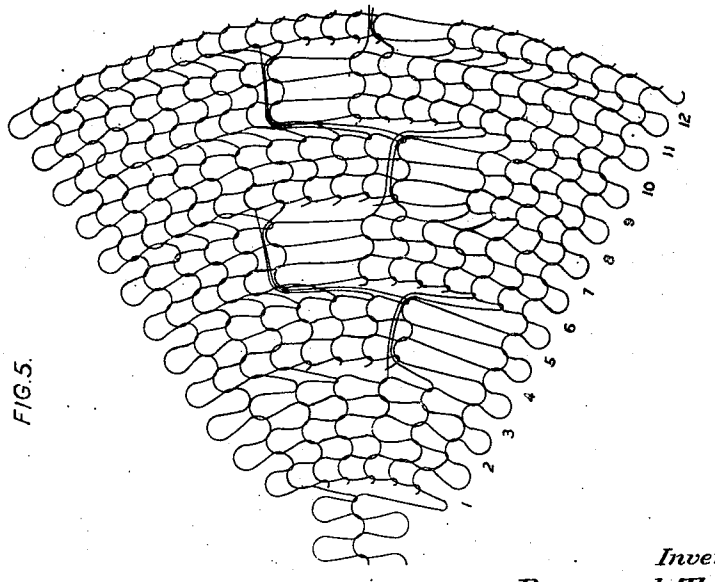


FIG. 5.

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UNITED STATES PATENT OFFICE

2,357,630

KNITTED ARTICLE

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Original application July 14, 1942, Serial No. 450,922. Divided and this application January 12, 1943, Serial No. 472,115. In Great Britain March 15, 1941

6 Claims. (Cl. 66—185)

This invention is for improvements in and relating to the manufacture of hose (which expression includes stockings, three-quarter hose and half hose) and like articles knit in the main by rotation and of substantially tubular form but having at least one integral pocket or pouch. Primarily the invention is concerned with the production of the heel and toe pockets in hose and with seamless hose and like knitting machines.

Heretofore in the production of seamless hose on a circular knitting machine it has been the usual practice to knit the leg and foot by rotation but to produce the heel and toe pockets by oscillation. In the exercise of the present invention such pockets are produced by rotation, and in order that the invention may be better understood reference will now be made to the accompanying drawings in which

Figure 1 shows the foot portion of a stocking, sock, or the like with heel and toe pouches according to this invention.

Figures 2, 3, 4 and 5 show a portion of a suture line in four alternative forms of pouch;

Figure 6 shows in the upper part a development of one of these pouches (e. g. the heel pouch), and below it a development of the knitting cams;

Figure 7 is a continuation of Fig. 6 showing certain cams and pickers, and alongside said cams a view of a needle and a jack.

The article 10 illustrated in Fig. 1 is provided with a heel pouch 11 constituted by narrowed and widened segments with suture lines 12 between them, and a like toe pouch 13 with suture lines 14. These pockets are of substantially normal appearance but instead of being knitted by reciprocation they are knitted by rotation. To do so, at the commencement of the pocket the instep needles included under the bracket A in Figs. 6 and 7 are moved to a position in which they retain their loops and knitting is continued on the pocket needles B, C, B' while rotation continues. At each of various successive courses in the formation of a pocket as illustrated in Figs. 1, 2 and 6, needles B and B' are progressively moved to the loop-holding position until only the needles C are active. Thereafter the needles B and B' are progressively restored to activity until all the pocket needles are active, after which the instep needles A are restored to activity also. It will therefore be appreciated that this reciprocal variation between two groups of needles, the inactive loop-holding needles and the active pocket-forming needles, results in the production of suture lines such as 12 and 14.

Since the pocket is knitted by rotation the courses of which it consists are not laid to and fro as in ordinary reciprocating knitting, but the fed yarn after being knitted by the last active needle in one course is next knitted by the first active needle at the other end of the group of active needles in the next course. Between the two courses the fed thread is excluded from the inactive needles and it may extend as a float thread from the last needle at the trailing end of the active needles to the first needle at the leading end thereof, such floats being cut away subsequently to the completion of the article or, as is preferred, the thread may be severed at the end of each course of the pouch and the cut end re-introduced at the first needle of the next course. It is preferred to make use of beating feeder; that is to say a thread feeder which is moved into and out of the operative position to feed thread only to those needles which are to knit (e. g. by the employment of mechanism substantially as described in the specification of United States Patent No. 2,295,450.)

The machine on which the article is knitted forms the subject matter of co-pending patent application Serial No. 450,922 filed July 14, 1942, from which the present application is divided, but in order to assist in an understanding of the construction of a sock or the like, a brief reference will be made to the machine and the method of knitting with particular reference to Figs. 6 and 7. The rotatable needle cylinder is provided with a circular series or full complement of needles 21 having alternate long and short butts 21*a*, and beneath each needle in the same trick there is a jack 22 the butts 22*a* of which are of contrasting length also. The jacks beneath the instep needles A all have long butts 22*a*; the jacks beneath the needles B and B' have alternate three-quarter and short butts, while the jacks beneath the needles C have either alternate three-quarter and short butts or all have three-quarter butts. It is these jacks which are employed to effect the progressive reciprocal exchange of needles between loop-holding inactivity and knitting activity. During circular knitting the needle butts 21*a* follow an active track 23, the needles clear at the clearing cam 27 and the butts descend a guard cam 28 to the stitch cams 29 and 30, being again elevated by cam 31. The lower edge of the cam 28 has a rebate 28' which is arranged to miss the short needle butts. Thus every second needle is lowered by cam 28

to a slightly greater extent than every intervening needle. This effects a division which permits the feeder eye of the yarn feeder to move between the needles into and out of operative position, the yarn being taken by the needles as their butts descend cam 29. During rotational knitting the butts 22a of all the jacks traverse a low track 26' below the knitting cams just mentioned and below guard cam 34, but the long butt jacks of the instep needles A are engaged by a cam 32 and are raised to a track 25 from which they are lowered to track 26 by bolt cam 33 underneath the clearing cam 27. The three-quarter and short butts of the jacks pass said cam 32 and remain in track 26.

At the commencement of a pocket the bolt cam 33 is withdrawn so that the long butt jacks continue along the track 25 over guard cam 34 which is arranged beneath the knitting cams. This cam has a V-shaped recess 35 immediately below the apex of cam 29. As the needles A descend cam 29 they are lowered on to the jacks 22 and the latter are caused to pass down to the apex of the recess 35, but as the jack butts travel up the further slope of the V the needles are raised and their butts are passed up a gap 36 between the cams 29, 30, the said butts being raised by said cam 30 to a loop-retaining idle track 24. Thus all the instep needles are caused to hold their loops, the other needles continuing down cam 30 to knit. The bolt cam 37 is also inserted to a sufficient extent to engage the three-quarter butts of the jacks B, B', and to raise them to a picking level indicated at 38, the short jack butts passing said cam 37. Thus the division is effected between odd and even jacks of needles B, B'. The division is cancelled by cam 41 and the first course of the pouch proper is knitted on needles B, B' after which the division is again made. The three-quarter butt jacks elevated to the picking level 38 (which may be considered to be the odd jacks) are then operated on by up-pickers 39 and 40. The picker 40 picks up the first two three-quarters butts of the group B from level 38 to level 25 and the picker 39 picks the last two-three-quarter butts of group B' from level 38 to level 25, so that the four needle butts associated therewith are caused to pass up the gap 36 and the picked needles hold their loops in the second course. That is to say, the first and third needles at each end of the pouch needles are selected to hold their loops. The cam 37 is now pushed right in to raise all the jack butts of active needles to picking height 38, said butts being lowered by cam 41. After the third course has been knitted in this manner the pickers 39, 40 are again rendered operative to pick the first two short butts and the last two short butts. That is to say, the butts associated with the second and fourth needles from each end of the group of heeling needles then active are picked. Cam 37 is now withdrawn to miss the short butts and the fourth course is knitted on the remaining active pouch needles. This sequence of picking is continued until all the needles B and B' have been moved to the loop-holding track.

The sequence of picking is therefore needles 1 and 3; 2 and 4; 5 and 7; 6 and 8 and so on, the odd numbered needles being those whereof the jacks 22 have three-quarter butts and the even needles those whereof the jacks have half butts. As a result at certain courses during the narrowing of the pouch there is an overlap of at least one needle between the inactive loop-holding needles and the active pouch knitting needles. For example during the knitting of the second course of the series the third needle is inactive and the second and fourth needles are active with the result that a series of thread loops are accumulated as knops on the third needle (such loops being actually accumulated on the third, seventh and eleventh etc. needles). This is shown in Fig. 2, wherein the needle wales and courses are numbered consecutively.

The thread feeder moves into operation as the first of the active pouch-knitting needles approaches the knitting cams and out of operation as the last of said active needles leaves the knitting cams, and the float thread at each course is either cut subsequently or the withdrawn thread is cut immediately whereby loose ends are produced at the suture lines, as will be seen in wales 1 and 2, 5 and 6 etc. of Fig. 2. In this figure the cut ends are for the sake of clarity shown very short. In practice they are somewhat longer and may either be knitted by or caught up into knops formed in the third, seventh etc. wales.

After all the needles B, B' have been moved to the loop-holding position it is necessary to re-introduce them progressively into activity. They are re-introduced in the same sequence by down pickers 42, 43; that is to say the picking sequence is 1 and 3, 2 and 4 etc. at the leading end of group B' and at the trailing end of group B. At least one course is knitted on the remaining active needles C, the cam 37 being withdrawn to miss the three-quarter butts. Dividing cams 44 and 45 are pushed part-way in and remain for two courses. The cam 44 raises the long and three-quarter butts from track 25; the long butts are immediately returned by cam 45 but the three-quarter butts continue until lowered by cam 27 and by the action of the needles descending cams 28 and 29. The short butts miss the cam 44 and continue at the down-picking level in track 25. In the second of these two courses the down-pickers 42, 43 are rendered operative to pick the last two short butts associated with needles B and the first two short butts associated with needles B' down to the track 26. As a result the associated needles descend the cam 30 and are re-introduced into knitting activity. For the third and fourth courses of the series of four courses cams 44, 45 are retracted to miss the three-quarter jack butts so that the three-quarter and half butts continue at the picking level 25. In the third course the down pickers 42, 43 are inactive, but they are rendered active after the fourth course has been knitted to pick down respectively the last two-three-quarter butts of the jacks of group B and the first three-quarter butts of the jacks of group B'. This four-course sequence continues until all pouch needles are re-introduced into knitting activity when the widening pickers 42, 43 are rendered inactive and the cam 33 is re-introduced to lower the long butt jacks so that the instep needles of group A are again rendered active and tubular knitting proceeds.

It will of course be understood that during this widening of the heel the thread is introduced and withdrawn in the same manner as during the narrowing.

In a modification illustrated in Fig. 3 at spaced courses throughout the narrowing and widening of the pouch all the inactive needles are caused to knit, for example by retracting that part of cam 34 that is indicated at 34'.

A further modified heel pocket is illustrated

in Fig. 4. Here the picking sequence is 2, 1, 4, 3, 6, 5, etc., the pickers being suitably modified to effect this sequence.

A still further modified form of pouch is shown in Fig. 5. Here the picking sequence is 3 and 4, 1 and 2, 7 and 8, 5 and 6 etc. and for this purpose instead of the three-quarter and half butts of the jacks 22 associated with the needles B and B' being alternated 1 and 1 they are alternated 2 and 2 in the needle cylinder.

It will be seen that a characteristic of the fabrics shown in Figs. 2–5 is that in certain courses, both during narrowing and widening, there is an overlap between the active and the loop-holding needles.

I claim:

1. In a knitted article of manufacture, provided with a pocket having suture lines, and wherein cut ends of the yarn from which the pocket is knitted are present: stitch formations of said yarn substantially restricted to the suture lines and disposed to lock said cut ends against drawing out.

2. In a knitted article of manufacture, provided with a pocket having suture lines, and wherein cut ends of the yarn from which the pocket is knitted are present: means for preventing drawing out of said cut ends, comprising accumulated loops of the pocket-forming yarn disposed to lock said cut ends.

3. A knitted article according to claim 2, wherein the accumulated loops are spaced along said suture lines.

4. In a knitted article of manufacture, provided with a pocket formed of courses of knitting converging to suture lines, and having cut ends of the yarn of said courses presented at said suture lines: means for locking said yarn ends against drawing out, comprising accumulated loops of the pocket courses spaced along said lines, and at least one knitted loop being disposed between a cut end and an accumulated loop in at least some spaced courses of the pocket.

5. A seamless sock or stocking having heel and toe pockets, at least one of which has suture lines, the pocket-forming yarn being severed and presenting cut yarn ends at said lines; and stitch formations of said yarn substantially confined to the suture lines and arranged to lock said cut ends against drawing out.

6. A mainly tubular knit article, having a pocket constituted by narrowed and widened segments with suture lines between them, the pocket-forming yarn being severed to present cut ends thereof in each course at the suture lines; and means for locking said cut yarn ends against drawing out, comprising stitch formations of said yarn disposed along said suture lines.

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